

Quick review items:

- A. The supercontinent in which all of the present-day continents were once combined was called "**Pangea**" (all Earth).
- B. The process in which new species evolve from old species is called "**radiation**" or "**adaptive radiation**".
- C. The accumulation of differences between populations is called "**divergence**".
- D. The process by which new species form is called "**speciation**".
- E. "**Gradualism**" is a model of evolution in which gradual change over a long time leads to biological diversity.

Review Questions:

- 1. Who observed variations in the characteristics of animals and plants on different islands of the Galapagos?
 - A. James Hutton.
 - B. Charles Lyell
 - C. Charles Darwin**
 - D. Thomas Malthus
- 2. In addition to observing living organisms, Darwin studied the preserved remains of ancient organisms, called
 - A. Fossils**
 - B. adaptations.
 - C. homologous structures
 - D. Vestigial organs.
- 3. Which of the following ideas proposed by Lamarck was later found to be incorrect?
 - A. Acquired characteristics can be inherited.**
 - B. All species were descended from other species.
 - C. Living things change over time.
 - D. Organisms are adapted to their environments.
- 4. Differences among individuals of a species are referred to as
 - A. natural variation**
 - B. fitness.
 - C. natural selection.
 - D. adaptation.
- 5. Which would an animal breeder use to produce cows that give more milk?
 - A. overproduction
 - B. genetic isolation
 - C. acquired characteristics
 - D. artificial selection.**

6. An inherited characteristic that increases an organism's ability to survive and reproduce in its specific environment is called a(n)
A. vestigial organ. C. speciation.
B. adaptation. D. radiation.
7. The concept that each living species has descended, with changes, from other species over time is referred to as
A. descent with modification. C. theory of acquired characteristics
B. artificial selection. D. natural selection.
8. Fitness is a result of
A. adaptations. C. common descent.
B. homologies. D. variation.
9. Structures that have different mature forms but develop from the same embryonic tissue are
A. vestigial organs. **C. homologous structures.**
B. adaptations. D. fossils.
10. The diagram below best illustrates
A. Lamarck's theory of evolution.
B. Darwin's theory of evolution.
C. Malthus's principles.
D. Lydell's theory about past changes.
11. Explain what is meant by the term *evolution*, and give an example.
→ Evolution, or change over time, is the process by which modern organisms have descended from ancient organisms. An example is a population of predators in which the fastest animals passed on their traits to new generations.
12. Describe three of Darwin's observations about animals in South America and on the Galapagos Islands.
→ Darwin observed fossils, some of which resembled living organisms and others that were unlike any organisms he knew; that organisms everywhere seemed remarkably well suited to their environments; and that similar organisms, such as tortoises, were different on each island.
13. How did the visit to the Galapagos Islands affect Darwin's thoughts on evolution?
→ Darwin's visit to the Galapagos Islands convinced him that new species might arise from existing species over time.

14. How did Hutton's and Lyell's views of Earth differ from that of most people of their time?
→ Hutton proposed that Earth had to be millions – not thousands – of years old. Lyell argued that the same forces change Earth in the present as in the past, so scientists should explain Earth's history in terms of processes that are observable in the present.
15. Explain Lamarck's principle of use and disuse.
→ Lamarck said that structures that are used develop and are passed on to offspring, whereas structures that are not used are not passed on.
16. How does natural variation affect evolution?
→ Natural variation provides the raw material for natural selection, which, in turn, leads to evolution.
17. What is artificial selection? How did this concept influence Darwin's thinking?
→ Artificial selection is the process by which humans select certain naturally occurring variations to use in breeding new plants and animals. Darwin thought that a similar process in nature could explain how organisms change over time.
18. Distinguish between fitness and adaptation. Give an example of each.
→ Fitness, the ability of an individual to survive and reproduce in its specific environment, occurs through ongoing adaptation. An example is an animal that survives through camouflage. An adaptation is any inherited characteristic that increases an organism's chance of survival. Examples include a porcupine's quills and a lion's teeth and claws.
19. How is the process of survival of the fittest related to a population's environment?
→ In the survival of the fittest, individuals that are best suited to their environment survive and reproduce most successfully.
20. How does Darwin's principle of descent with modification explain the characteristics of today's species?
→ Descent with modification explains why organisms living today may be different from their ancestors, for example by having different structures.
21. What does fossil evidence show about evolution?
→ Fossils that formed in different layers of rock provide evidence of the way species changed over time.

22. What evidence of evolution can be found in the geographic distribution of living animals? Give an example.
→ Evidence of evolution in living animals includes the existence of unrelated organisms from different locations that share traits because they evolved from similar environments. An example is the beaver in North America and the capybara in South America.
23. What is a vestigial organ? Give an example.
→ A vestigial organ is an organ, such as the human appendix, that is reduced in size and no longer has a function.
24. How do scientists use similarities in embryology as evidence for evolution?
→ Similarities in embryology of different species have been used as evidence that the species evolved from a common ancestor.
25. Summarize the main ideas in Darwin's theory.
→ Variations occur within populations, and some of the variations are favorable. More offspring are produced than can survive, and individuals with favorable variations are more likely to survive. Because of this, changes accumulate in populations over long periods of time.
26. How does the process of natural selection account for the diversity of organisms that Darwin observed on the Galápagos Islands?
→ Natural selection leads to organisms being better adapted to their environments and explains the diversity of organisms "Darwin observed on the Galápagos Islands, which have varied environments.
27. Explain how natural selection might have produced the modern giraffe from short-necked ancestors.
→ Giraffes with slightly longer necks could reach plant materials that those with shorter necks could not reach and, therefore, would have a better chance of surviving and passing on their genes. Over many generations of natural selection, the long necks of modern giraffes evolved.
28. DDT is an insecticide that was first used in the 1940s to kill mosquitoes and stop the spread of malaria. At first, it was very effective. However, over a period of years, people began to notice that it was becoming less and less effective. A possible explanation for this was that the insects were becoming resistant to the DDT. Explain how the resistance may have evolved.
→ The few mosquitoes that were resistant to DDT survived and reproduced, whereas those that were not resistant were killed by the insecticide. The succeeding populations of mosquitoes were more resistant to DDT.

29. Although wild turkeys can fly, domesticated turkeys cannot. Suppose that a population of domesticated turkeys escaped from a farm into a new environment. Give examples of environmental conditions that might determine whether that population would survive over time.
→ Their survival might depend on how well the turkey could avoid predators and whether there was an adequate food supply.
30. Is protecting an endangered species upsetting the process of natural selection? Explain your answer.
→ Most endangered species are endangered because human actions have changed or destroyed their habitats. Protecting endangered species – for example, by preserving their habitats or providing them with nesting sites – may restore the natural conditions.